U.S. Application No.: 10/563,370
Inventors: Massimo BRUSAROSCO et al.
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AMENDMENTS TO THE CLAIMS:

The following listing of claim will replace all prior versions and listings of claims in the application. Please amend claim 57, as follows:

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Claims 1-47 (Canceled).

48. (Previously Presented) A method for determining a load exerted on a tyre, fitted on a vehicle, during running of the vehicle on a rolling surface, the method comprising:

acquiring a first signal comprising a first signal portion representative of a radial deformation;

measuring an amplitude of the radial deformation in the first signal portion;

estimating a rotation speed of the tyre corresponding to the radial deformation;

estimating an inflation pressure of the tyre corresponding to the radial deformation; and

deriving the load exerted on the tyre from the amplitude, the rotation speed, and the inflation pressure;

wherein the first signal portion is representative of the radial deformation to which a first tread area portion of the tyre is subjected during passage of the first tread area portion through a contact region between the tyre and the rolling surface.

49. (Previously Presented) The method of claim 48, wherein the first signal comprises a radial acceleration signal.

50. (Previously Presented) The method of claim 48, wherein measuring the amplitude of the radial deformation comprises measuring a difference between:

a maximum value of the first signal in the first signal portion; and

a minimum value of the first signal in the first signal portion.

51. (Previously Presented) The method of claim 48, further comprising:

low-pass filtering the first signal before measuring the amplitude of the radial deformation.

52. (Previously Presented) The method of claim 48, wherein estimating the rotation speed of the tyre comprises:

measuring an average value of the first signal in a second signal portion;

wherein a time period associated with the second signal portion does not overlap a time period associated with the first signal portion.

53. (Previously Presented) The method of claim 48, wherein estimating the rotation speed of the tyre comprises measuring an average value of the first signal corresponding to an entire revolution of the tyre.

54. (Previously Presented) The method of claim 48, further comprising:

acquiring a second signal representative of a radial acceleration to which a second tread area portion of the tyre is subjected.

55. (Previously Presented) The method of claim 54, wherein estimating the rotation speed of the tyre comprises:

measuring a value of the second signal during passage of the first tread area portion through the contact region between the tyre and the rolling surface.

56. (Previously Presented) The method of claim 48, further comprising:

sampling the first signal at a frequency greater than or equal to 5 kHz before measuring the amplitude of the radial deformation.

57. (Currently Amended) The method of claim [[48]] 56, further comprising:

sampling the first signal at a frequency greater than or equal to 7 kHz before measuring the amplitude of the radial deformation.

58. (Previously Presented) The method of claim 48, further comprising:

providing characteristic functions describing an expected radial-deformation amplitude versus rotation speed that correspond to predetermined conditions of load exerted on the tyre and inflation pressure.

59. (Previously Presented) The method of claim 58, wherein the characteristic functions comprise polynomial functions.

60. (Previously Presented) The method of claim 58, wherein deriving the load exerted on the tyre comprises:

identifying a set of characteristic functions corresponding to the estimated inflation pressure; and

determining, from the set of characteristic functions, a corresponding set of expected radial-deformation amplitudes corresponding to the estimated rotation speed.

61. (Previously Presented) The method of claim 60, wherein deriving the load exerted on the tyre further comprises:

comparing the measured radial-deformation amplitude with any one of the set of expected radial-deformation amplitudes in order to identify a closest expected radial-deformation amplitude; and

establishing the load exerted on the tyre based on the closest expected radial-deformation amplitude.

62. (Previously Presented) A method of controlling a vehicle having at least one tyre fitted on the vehicle, the method comprising:

determining a load exerted on the at least one tyre;

passing the determined load to a vehicle control system of the vehicle; and

adjusting at least one parameter in the vehicle control system based on the determined load;

wherein the load exerted on the at least one tyre is determined by a method comprising:

acquiring a first signal comprising a first signal portion representative of a radial deformation;

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measuring an amplitude of the radial deformation in the first signal portion;

estimating a rotation speed of the at least one tyre corresponding to the radial deformation;

estimating an inflation pressure of the at least one tyre corresponding to the radial deformation; and

deriving the load exerted on the at least one tyre from the amplitude, the rotation speed, and the inflation pressure; and

wherein the first signal portion is representative of the radial deformation to which a first tread area portion of the at least one tyre is subjected during passage of the first tread area portion through a contact region between the at least one tyre and a rolling surface.

63. (Previously Presented) The method of claim 62, wherein the vehicle control system comprises:

a brake control system;

wherein adjusting the at least one parameter comprises adjusting a braking force on the at least one tyre.

64. (Previously Presented) The method of claim 62, wherein the vehicle control system comprises:

a steering control system;

wherein adjusting the at least one parameter comprises selecting a maximum variation allowed from steering commands.

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65. (Previously Presented) The method of claim 62, wherein the vehicle control system comprises:

a suspension control system;

wherein adjusting the at least one parameter comprises adjusting stiffness of a suspension spring associated with the at least one tyre.

66. (Previously Presented) The method of claim 62, wherein the vehicle comprises at least one tyre fitted on each of two opposite sides of the vehicle,

wherein the vehicle control system comprises an active roll control system, and

wherein adjusting the at least one parameter comprises compensating an unequal load distribution between the at least one tyre fitted on each of two opposite sides of the vehicle.

67. (Previously Presented) A system for determining a load exerted on a tyre, fitted on a vehicle, during running of the vehicle on a rolling surface, the system comprising:

a measuring device;

a pressure sensor;

a device for estimating a rotation speed of the tyre; and

at least one processing unit;

wherein the measuring device is adapted to acquire a signal representative of a deformation to which a first tread area portion of the tyre is subjected during passage of

the first tread area portion through a contact region between the tyre and the rolling surface,

wherein the pressure sensor is adapted to sense an inflation pressure of the tyre,

wherein the at least one processing unit is adapted to determine an amplitude of a radial deformation in a first portion of the signal, and

wherein the at least one processing unit also is adapted to derive the load exerted on the tyre from the rotation speed, the inflation pressure, and the amplitude.

68. (Previously Presented) The system of claim 67, wherein the measuring device comprises:

a radial accelerometer.

69. (Previously Presented) The system of claim 67, wherein the measuring device comprises:

a sampling device;

wherein the sampling device is adapted to sample the signal at a frequency greater than or equal to 5 kHz.

70. (Previously Presented) The system of claim 67, wherein the measuring device comprises:

a sampling device;

wherein the sampling device is adapted to sample the signal at a frequency greater than or equal to 7 kHz.

71. (Previously Presented) The system of claim 67, further comprising:

at least one memory;

wherein the at least one memory is associated with the at least one processing unit.

72. (Previously Presented) The system of claim 71, wherein the at least one memory comprises:

pre-stored characteristic functions;

wherein the pre-stored characteristic functions describe an expected radial-deformation amplitude versus rotation speed that corresponds to predetermined conditions of load exerted on the tyre and inflation pressure.

73. (Previously Presented) The system of claim 72, wherein the pre-stored characteristic functions comprise polynomial functions.

74. (Previously Presented) The system of claim 71, wherein the at least one memory comprises pre-stored instructions for the at least one processing unit.

75. (Previously Presented) The system of claim 74, wherein the pre-stored instructions comprise at least one first set of instructions adapted to:

identify a set of characteristic functions corresponding to a sensed inflation pressure; and

determine, from the set of characteristic functions, a corresponding set of expected radial-deformation amplitudes corresponding to the estimated rotation speed.

76. (Previously Presented) The system of claim 75, wherein the pre-stored instructions comprise at least one second set of instructions adapted to:

compare the determined radial-deformation amplitude with any one of the set of expected radial-deformation amplitudes in order to identify a closest expected radial-deformation amplitude; and

establish the load exerted on the tyre based on the closest expected radial-deformation amplitude.

77. (Previously Presented) The system of claim 67, wherein the measuring device is included in a sensor device disposed in a tread area portion of the tyre.

78. (Previously Presented) The system of claim 77, wherein the sensor device is disposed near an equatorial plane of the tyre.

79. (Previously Presented) The system of claim 77, wherein the sensor device is secured to an inner liner of the tyre.

80. (Previously Presented) The system of claim 79, further comprising:

a damping element between the sensor and the inner liner.

81. (Previously Presented) The system of claim 77, wherein the sensor device comprises a transmitting device.

82. (Previously Presented) The system of claim 81, wherein the transmitting device is operatively connected to a first antenna.

83. (Previously Presented) The system of claim 67, further comprising:

a filtering device;

wherein the filtering device is adapted for low-pass filtering the signal.

84. (Previously Presented) The system of claim 77, wherein the sensor device further comprises a power source.

85. (Previously Presented) The system of claim 84, wherein the power source comprises a battery.

86. (Previously Presented) The system of claim 84, wherein the power source comprises:

a self-powering device;

wherein the self-powering device is adapted to generate electrical power as a result of mechanical stresses undergone by the sensor device during the running of the vehicle.

87. (Previously Presented) The system of claim 86, wherein the self-powering device comprises a piezoelectric element.

88. (Previously Presented) The system of claim 86, wherein the self-powering device comprises an electrical storage circuit.

89. (Previously Presented) The system of claim 88, wherein the electrical storage circuit comprises:

a resistor; and

a capacitor.

90. (Previously Presented) The system of claim 77, wherein the sensor device comprises the at least one processing unit.

91. (Previously Presented) The system of claim 77, further comprising:

a fixed unit located on the vehicle;

wherein the fixed unit comprises a receiving device for receiving data from the sensor device.

92. (Previously Presented) The system of claim 91, wherein the sensor device further comprises:

a transmitting device;

wherein the transmitting device is operatively connected to a first antenna, and

wherein the receiving device comprises a second antenna.

93. (Previously Presented) The system of claim 92, wherein the first and second antennas are adapted for data transmission at a frequency greater than or equal to 400 MHz and less than or equal to 450 MHz.

94. (Previously Presented) The system of claim 67, wherein the device for estimating the rotation speed of the tyre is the at least one processing unit.